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Exchange Rate Volatility and Foreign Investment Flows: A Dynamic Panel Analysis with African Countries

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Abstract

This paper aims at investigating whether or not volatility in exchange rate invites foreign investment into Africa or dissuade same using dynamic panel GMM estimation framework from 2010 to 2020. In particular, we implemented the Arellano-Bond first-difference GMM and system GMM estimators since we needed to estimate a dynamic *fdi* model of panel data of different African countries using Common Market for Eastern and Southern Africa region as a case study. Two set of control predictors were used in estimation and these are macroeconomic policy variables and governance and institutional variables. Dominant influence of this study thus upholds that there are prevailing negative side effects of exchange rate volatility that dissuades inflows of *fdi* to African countries. The volatility coefficients are -0.3021 and -0.3015 for first-difference GMM and System GMM estimator respectively. And the adverse effects of such volatility are exceedingly significant. Accordingly, exchange rate volatility manifest in macroeconomic unpredictability that crowds out foreign investment. This could be explained by the fact that such volatility and/or instability in exchange rate intensifies economic uncertainty which heightens foreign investors' lack of confidence in the domestic macroeconomic environment. The study also points to the fact that inflows of *fdi* tracks trajectory of previously existing inflows of *fdi*. Precisely, COMESA region ought to strategize to maximize benefits of hitherto prevailing *fdi* inflows.

Keywords: COMESA, *fdi*, governance, dynamic panel model, first-difference GMM, system-GMM.

1. Introduction

This study aims at investigating whether or not there are still side effects of exchange rate volatility on foreign investment in COMESA. COMESA is Common Market for Eastern and Southern Africa region which influences foreign investment flows for example COMESA common investment agreement and COMESA regional investment agency (Sichei, Kinyondo, 2012). Kenya, a COMESA nation runs market-based economy with leading financial base in East and Central Africa with GDP of US \$ 85.980 billion. Uganda's economy is growing at 4.5 % per annum with 2018 GDP estimate US \$ 26.391 billion (World Bank, 2021). In Burundi, agriculture is strength of her economy, employing over 80 % of workforce and has estimated GDP of US\$7.985 billion. However, Burundi has about 72 % masses living beneath poverty line.

Comoros's growth index stood at US2.5 in 2017 with GDP estimate of US\$1.329 billion. This was credited to remittances in addition to amplified electrical power supply connectivity. The economy is essentially driven by demand-based consumer goods. Congo is endowed with mammoth natural resource base and GDP estimate of US \$ 67.988 billion in 2017 (UNCTAD,

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2017). On her part, Djibouti is dynamic participant of COMESA with GDP estimate of US \$ 4.005 billion.

Egyptian economy is profoundly driven by consumer market, exports, and investments, with foreign reserves of US \$ 42.5 million and GDP estimate of US \$ 1.393 Trillion (World Bank, 2018). GDP estimate of Swaziland is US \$ 11.763 billion and runs developing lower-middle income economy with agriculture and manufacturing sectors providing wholesale employment. The economy of Eritrea grows slowly with 2020 GDP estimate of US \$ 10.176 billion (World Bank, 2021). With heroic economic growth averaging 10.9 % of GDP, Ethiopia's GDP estimate is US \$ 216.449 billion. Economic activities in Ethiopia revolve around export and domestic consumption of agricultural produce.

Libya economy witnessed political conflict that barred oil supply and this crumbled her economy. Presently, Libya's estimated GDP is US \$ 77 billion with GDP per capita settling at US \$ 4,500 (AfDB, 2017). Libya's Oil accounts for 97 % of her export and contributes more than half of GDP. In 2017, Ethiopia's GDP was valued at US \$ 80.56 billion with *fdi* stocks of 23.6 % of GDP and this equals US \$ 18.5 billion (UNCTAD, 2021).

Madagascar runs market driven economy with estimated GDP of US\$40.055 billion. Malawi's GDP (PPP) stands at US\$12.81 billion with an economy that is highly funded by World Bank and IMF. Mauritius controls upper middle-income economy with GDP estimate of US \$ 13.297 billion (World Bank, 2017). Fishing and agriculture employ 8 %; construction employs 29.8 % while transport and communications takes care of 63.5 % of Mauritius' employees.

Rwanda's economy was gravely dented following genocide in 1994 such that looting instigated unfathomable drop in GDP. Currently, her GDP estimate is US \$ 8.918 billion. The economy of Rwanda is sustained by agriculture which employs about 90 %. Seychelles has highest GDP per capita in Africa of US\$15410 with GDP estimate of US \$ 1.564 billion (World Bank, 2018).

Somalia experienced peaceful transition of power in 2017 and identified political stability as key in development. Her current GDP estimate is US \$ 5.8 billion. Sudanese economy which is mostly influenced by oil export with 2018 GDP estimate of US \$ 138.090 billion is recently characterized by political conflict. Tunisia's economy is export-oriented with GDP estimate of US\$40.455 billion. Agriculture alone accounts for 11.65 % of GDP while services and manufacturing account for 62.8 % and 25.7 % respectively.

Zambia whose annual exports hover around US \$ 7 billion and US\$8 billion homes COMESA secretariat. With GDP estimate of US \$ 17.105 billion, Zimbabwe's foreign exports are principally controlled by agricultural products and minerals.

Overall, COMESA controls aggregate population of about 520 million people and global trade portfolio of US \$ 245 billion (UNCTAD, 2021). The COMESA region seems attractive for investment as demonstrated by recovery in Egyptian *fdi* performance with observed amplified flows to resource endowed COMESA countries. Some investment opportunities in COMESA region include agriculture, infrastructure, minerals, oil and gas, manufacturing, and services.

Moreover, it is widely recognized that in globalizing business environment, significant inflows of *fdi* plays suitable role in country's economic performance. This is particularly factual for COMESA region which has positive prospects of growing consumer markets as we have seen above. However, with *fdi* as leading source of foreign capital inflows to Africa, it is asymmetrically distributed across COMESA members with 15 oil-rich countries explaining 75 % of *fdi* flow (AfDB et al., 2011) and this has influenced our attention towards quantifying agglomeration effect of *fdi* in COMESA as earlier mentioned. We have six sections in this paper. Second section provides trend of net FDI in COMESA, while third section reviewed literature germane to our subject. In fourth section, we theoretical framework and model specification while fifth section contains estimation results. Final section six summarizes and so concludes.

FDI Trends in COMESA Region

As shown in figure 1, FDI inflows totalled US\$106 billion in COMESA region in 2017. This unfavourably compared with inflows of US\$16 billion in 2016, with three highest destinations (Egypt, Ethiopia and Uganda) of positive growth of FDI accounting for 76 % of such inflows (WDI, 2017). Egypt as a nation chronicled the uppermost market share of thirty percent owing to oil sector investments. other countries such as Mauritius, Zimbabwe, Ethiopia, Sudan, Kenya, Eritrea, Libya, Burundi, Uganda, and Seychelles all recorded positive growth in inward FDI flows with exception of Swaziland with net inflows of -1.35 %. Mauritius recorded 2.19 % net inflows,

Zimbabwe had 1.62 %, Ethiopia had 4.45 %, Sudan had 0.91 %, Kenya recorded 0.09 %, Eritrea had 2.26 %, Libya recorded 4.97 %, Burundi had 0.01 %, Uganda, Seychelles and celebrated 2.70 %, 8.38 % and 3.21 % respectively.

Malawi with 8.14 % FDI net inflows as fraction of GDP, ranked highest in 2015. Swaziland came lowest with FDI net inflows of 0.77 % of GDP which represented 0.28 % base ratio in contrast to the SSA. In 2015, Congo alone allocated 1.46 % of GDP to FDI outflows. Seychelles recorded 6.06 % of GDP and so ranked least in terms of FDI net outflows whereas Libya had US\$864 million highest outflows of FDI. Comoros had about 1.33 % inflows of FDI compared to Zambia which had US\$141 million inflows of FDI in 2015. Based on 2018 data, DRC, Zambia and Sudan chronicled regressions in inward FDI flows of 28 %, 24 % and 2 % separately (UNCTAD, 2021). Cheap commodity prices such as copper which affected expansion plans among investors serves as an explanatory factor for decline in the inflows to Zambia.

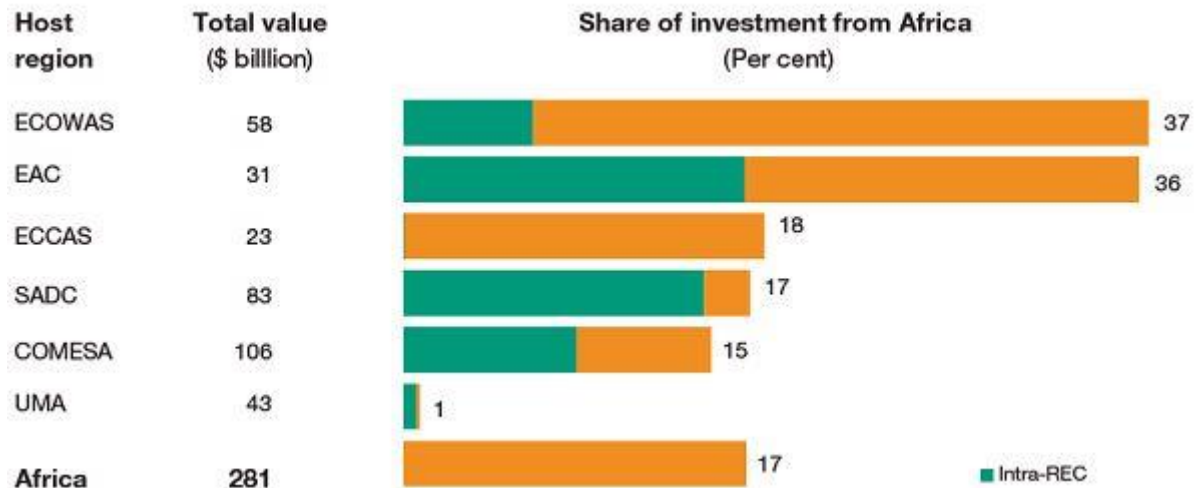


Fig. 1. FDI Greenfield Projects (Cumulative 2009–2019).

Source: UNCTAD, 2021

2. Literature Review

Here, we review literature on determinants of *fdi* into Africa base on three categorizations namely, demand-side factors, supply-side factors and institutional factors. Since our study is region based, we limit our review to country and cross-country studies rather than having sectoral review.

Demand-side Factors of FDI

Demand-side are pull factors which are internal to recipients of *fdi* such as interest rates, tariff levels, market size, cost differentials, exchange rates, fiscal policies, trade policies, while push factors are supply-side determinants are (Gottschalk, 2001).

Some studies found no significant association between level of exchange rate and *fdi* inflows (Brahmasrene, Jiranyakul, 2001; Ajayi, 2006; Naudé, Krugell, 2007; Kyereboah-Coleman, Agyire-Tettey, 2008). Privatization, trade regime, governance infrastructural density, and agglomeration attract new *fdi* (Globerman, 2002; Botrić, Škufljić, 2005). Natural resources, size of host economy, market accession, labour quality, government size, and institutional variables positively and significantly affect *fdi* inflows (Aseidu, 2002; Deichmann et al., 2003; Tarzi, 2005; Asiedu, 2006; Dupasquier, Osakwe, 2006; Hailu, 2010; Mohamed, Sidiropoulos, 2010).

In the study of Nimesh (2009) using Arellano Bond and IV methods of estimations volatility of exchange rate impacted negatively on *fdi* from US. Arbatli (2011) found for a sample of forty-six countries that managed floating exchange rate system was less risky in inviting foreign investment as against a floating regime.

Studies by Tokunbo & Lloyd (2009); Jie Qin (2000); Furceri & Borelli (2008); and Bouoiyour & Rey (2005) conveyed a non-negative impact of volatility of exchange rate on *fdi*. According to Tokunbo & Lloyd (2009), a positive correlation exists between exchange rate and inflows of foreign investment in Nigeria. Jie Qin (2000) reported a favorable relation between exchange rate volatility and two-way *fdi*. To Furceri & Borelli (2008), volatility of exchange rate impacted favorably on foreign investment flows for somewhat closed economies whereas, it

impacted adversely on economies with trade openness. Noted by Bouoiyour & Rey (2005) is the fact that volatility in real effective exchange rate had no adverse effect on *fdi*.

Brzozowski (2003) found that volatility in exchange rate uncertainty adversely impacted the inflows of thirty two countries having utilized the fixed effects OLS and GMM Arellano-Bond estimation techniques. Barrell et al. (2003) adopted the GMM estimation method on panel of seven industries and obtained strong negative correlation between exchange rate volatility in Europe, America and UK foreign investment inflows. Relatively, in the study of Becker & Hall (2003) using the GMM estimator, it was reported that foreign investment settles in the UK from Europe as a result of Euro-Dollar exchange rate volatility. Gerardo & Felipe (2002) found that stability in exchange rate attracts foreign investment flows.

Some studies have reported business location, trade and financial liberalization in developing nations as fundamental bases of *fdi* inflows in developing countries (Morisset, 2000; Asiedu 2002; Ali, Fiess, Macdonald, 2010; Asiedu, Freeman, 2009; Asiedu, 2004; Asiedu, 2006). For some studies, inflation, exchange rate, taxes, and tariffs have discouraged inflow of FDI into Africa as it bounds investors' confidence (Addison, Heshmati, 2003; Onyeiwu, Shrestha, 2004).

Infrastructural development and political stability, democratic rights and systems of efficient law and order have all been reported as significant causes of *fdi* inflows (Busse, Hefeker, 2005). Some researchers have found strategic role played by market size, GDP growth, education, external debt, political stability, real interest rate, international reserves, natural resources index and real wages in attracting African *fdi* inflows (Dutta, Roy, 2008). Positive effect was realized for market size, international reserves, openness, political stability and natural resources index whilst negative effect was obtained for inflation, external debt, real interest rate, international reserves and taxation.

Financial development, government size, macroeconomic uncertainty, per capita GDP growth, literacy rates, and infrastructure altogether exert positive influenced inflows of *fdi* whilst real exchange rate and taxation, political rights, civil rights and liquidity size of market were negative factors (Ang, 2007; Mkenda, Mkenda, 2004).

Industrial production index, workers remittances, urbanization, infrastructure, government size exerted positive effect on *fdi* while *fdi* was found to be negatively correlated with real effective exchange rate, financial development, and index of political rights (Anyunwa, Erhijakpor, 2004; 2010).

Supply-side Factors of FDI

Supply-side factors are push determinants of inflows which include skilled labour, research and development, cyclical, structural conditions, irreversibility and these are indeed external to the recipients of *fdi*. Distance/transport costs, factor endowments, and political stability seems to play significant role in influencing ample inflows (Mateev, 2009)

Substantial business climate that attract *fdi* flows relate infrastructure, labour costs and availability of skilled labour/education, incentive factors, political risk, economic factors, other significant social factors of inflow of *fdi* include degree of urbanization, infrastructure, ICT infrastructure, telecommunications infrastructures and political stability (Nnadozie, Osili, 2004; Musila, Sigue, 2006; Dupasquier, Osakwe, 2006; Mengistu, Adams, 2007; Cotton, Ramachandran, 2001; Zhang, 2001; Kersan-Skabic, Orlic, 2007; Botric, Škuflic, 2006; Gholami et al., 2006; Sekkat, Veganzones-Varoudakis, 2007; Dauti, 2008).

Economic influences ranging from portfolio expansion scheme of investors, per capita GDP, GDP growth rate, economic integration, importance of transport, commerce and communication, and market size of host country, institutions, exchange rate movements and their volatility, investment climate are significant causes of *fdi* flows (Daude, Stein, 2007; Sekkat, Veganzones-Varoudakis, 2007).

Human development, knowledge capital, level of schooling, export orientation, human capital, productivity, population health drives *fdi* inflows most importantly (Baeka, Okawa, 2001; Markusen, 2001; Noorbakhsh et al., 2001; Alsan et al., 2006; Oladipo, 2008; Rodríguez, Pallas, 2008; Reiter et al., 2010).

Labour cost, wealth, real income, banking sector credit, development of the stock market, real exchange rate and expected exchange rate changes, political risks, imports, labour costs, and market growth are significant determinants of *fdi* inflows (Jenkins, Thomas, 2002; Deichmann et al., 2003; Bevan, Estrin, 2004; Ramiraz, 2006; Jeon, Rhee, 2008; Nasser, Gomez, 2009; Brahmastre, Jiranyakul, 2001; Nnadozie, Osili, 2004; Zheng, 2009). Population, distance, GDP, risk, labour costs, stock market trading volume, and bank credit positively determines size of *fdi* flows into transition economies (Mateev, 2009; Nasser, Gomez, 2009; Leitão, 2010).

Institutional factors

Also are institutional determinants of inflows of *fdi* and these are culture, intellectual property rights, transaction costs, political risk, corruption, and bureaucracy (Lall et al., 2003; Benassy-quere et al., 2007; Fan et al., 2009). While political stability, government efficacy, lesser corruption are central factors in attracting FDI inflows, financial and political risk were denoted adverse factors of *fdi* (Jenson, 2002; Janicki, Wunnava, 2004; Mijiyawa, 2015; Rodriguez-Pose, Cols, 2017).

Regulations and policies, excessive regulatory burden, agglomeration, corruption and low transparency, government instability and lack of commitment are significant influencers in daunting *fdi* (Habib, Zurawicki, 2002; Zhao, Du, 2003; Campos, Kinoshita, 2003; Voyer, Beamish, 2004; Disdier, Mayer, 2004; Fedderke, Romm, 2006; Khamfula, 2007; Kapuria-Foreman, 2007; Kersan-Skabic, Orlic, 2007; Al-Sadig, 2009; Kinda, 2010).

Institutional aspects such as propriety rights, poor governance and unwelcoming regulatory environments, restrictions on equity capitals, rule of law, foreign ownership ceiling in sectors open for *fdi*, political instability, repatriation policy, expropriation risk in services and manufacturing sectors are robust negative predictor of inflows of *fdi* (Cotton, Ramachandran, 2001; Tarzi, 2005; Dupasquier, Osakwe, 2006; Ali et al., 2006; Dupasquier, Osakwe, 2006; Kyereboah-Coleman, Agyire-Tettey, 2008).

Also, business regulations, stock market, inefficient public governance, high taxation, inefficient infrastructure, political risk, physical infrastructure problems, financing constraints, and institutional problems discourage *fdi*, legal instability reduces inflow of *fdi* (Baniak et al., 2005; Clarke, Logan, 2008; Pantelidis, Nikolopoulos, 2008; Hailu, 2010; Kinda, 2010).

Summary of Review

Having reviewed previous studies on *fdi* flows for diverse regions using different estimators we found that inflows of *fdi* are both policy and non-policy driven especially in oil-rich Africa countries such as South Africa, Angola, Nigeria, Equatorial Guinea, Egypt, and few other mineral reliant economies but as influenced by data type used in estimation. Hence, our focus on agglomeration effects seems admissible considering role of inclusive inward *fdi* could accomplish in economies of COMESA region where majority of member states relies on agriculture and manufacturing as strength.

3. Results**Model Specification**

Moving from static to dynamic, the dynamic panel model utilized in this study encompasses lags of *fdi* as a regressor in order to provide for inertia as specified in equation (2):

$$fdi_{(it)} = \phi_i + X_{(it)}\delta + e_{(it)} \quad (1)$$

$$\forall t = 2003, 2004, \dots, 2020, i = 1, 2, \dots, 18$$

Where *fdi* is foreign direct investment which serves as a measure of foreign investment; $X_{(it)}$ is a vector of explanatory variables; namely, exchange rate volatility, trade openness, and macroeconomic environment; corruption control; and government stability; *i* symbolizes countries; *t* symbolizes time; ϕ_i is time-invariant unobservable African country effect; $\varepsilon(it)$ is stochastic disturbance which is $\varepsilon(it) \square iid(0, \sigma_\varepsilon^2)$.

$$fdi_{(it)} = \phi_i + X_{(it)}\delta + \rho fdi_{(it-1)} + e_{(it)} \quad (2)$$

$$\forall t = 2003, 2004, \dots, 2020, i = 1, 2, \dots, 18$$

Differencing the variables of the equation, we eliminated the individual African country effect as shown in equation (3),

$$\Delta fdi_{(it)} = fdi_{(it)} - fdi_{(it-1)} = \Delta X_{(it)}\delta + \rho \Delta fdi_{(it-1)} + \Delta e_{(it)} \quad (3)$$

$$\forall t = 2003, 2004, \dots, 2020, i = 1, 2, \dots, 18$$

Given the presence of ϕ_i , the time varying coefficient, we estimate with the GMM estimator,

$$GMM = fdi \left[\Delta D' M (M' \Omega M)^{-1} M' \Delta D \right]^{-1} \Delta D' M (M' \Omega M)^{-1} \delta M' \Delta fdi \quad (4)$$

where M is the instrument matrix for ΔD ; and Ω is a consistent and asymptotically efficient matrix even in the presence of heteroskedasticity and is obtainable from the variance of the error terms for the one-step Arellano-Bond (A-B) estimator.

Accordingly, the A-B estimator uses the ensuing moment conditions that form basis for the instrument matrix of the IV estimator are given by:

$$E(fdi_{(it-1)}\Delta e_{(it)})=0 \quad \forall t \geq 3, T \geq 2 \quad (5)$$

$$E(M_i^T \Delta e_i)=0 \quad (6)$$

Blundell & Bond (1998) derived further the following moment conditions (eqn 7) under which the instrument matrix for the IV estimator improves the A-B estimator.

$$E(\Delta fdi_{(it-1)}[\phi_i + e_{it}])=0 \quad \forall t \geq 3 \quad (7)$$

This gives the system GMM estimator:

$$E(M_{SYS,i}^T W_i)=0 \quad (8)$$

Where,

$$M_{SYS,i} = \begin{pmatrix} M_i & 0 & 0 & 0 \\ 0 & \Delta fdi_{i2} & 0 & 0 \\ 0 & 0 & \Delta fdi_{i3} & 0 \end{pmatrix}, W_i = \begin{pmatrix} \Delta e_i \\ e_{i2} \\ e_{i3} \end{pmatrix}$$

In estimation therefore, we utilized first-difference GMM estimator by Arellano & Bond (1991) which uses differenced variables that are strictly exogenous with all their available lags in levels as well as system-GMM estimator by Blundell & Bond (1998) that uses lag of differences of endogenous variable. Our econometric methodology is based on dynamic panel GMM estimation framework (Cleeve, 2008; Baniak et al., 2005; Sekkat, Veganzones-Varoudakis, 2007; Pantelidis, Nikolopoulos, 2008; Kinda, 2010) since it removes country fixed/time-invariant effects and correlation between our agglomeration variable namely, $FDI(it-2)$ and $e(it)$ and so applied, we circumvents Nickell bias via differencing (Baltagi et al., 2009).

Data, Variables and Sources

Data used in this study covers a sample period from 2010 to 2020. In addition to exchange rate volatility, two sets of control variables exploited in our specification of the dynamic panel GMM estimation include:

- Macroeconomic variables;
- Trade openness (T);
- Macroeconomic environment (ME);
- Governance and Institutional variables;
- Corruption control index (CC);
- Government stability (GS).

Explanations of Variables: Exchange rate volatility was calculated as standard deviation and misalignment of logarithm of real effective exchange rate, fdi is net inflows of fdi as fraction of GDP, trade openness, macroeconomic environment measured by inflation rate, government stability measured by logarithm of duration in power of constitutionally elected government, and corruption control calculated using data on transparency index. Data were sourced from WDI of World Bank (2020, 2021) and World Governance Indicators dataset and UNCTAD database.

Taking note that fdi decisions are often made based on historical data (Lederman et al., 2010; Anyanwu, 2011), we improve our fdi inflow data by devising double lag to arrive at second lag of net inflows of fdi as fraction of GDP. Accordingly, we deem it fit to equally exploit first lag of other predictors as instruments in the system GMM estimation process. Note: in our analysis, “***” designates significance at 1 %; “**” symbolizes significance at 5 % level respectively.

Estimation Results

In our estimations, exogeneity of instruments is accepted by difference-in-Hansen test with chi-square statistic(s) of 29.356 and 25.498 (Table 4); 29.016 and 29.023 (Table 5) respectively

with p-value of 0.0000 each. This was corroborated by significant Wald test statistic with 0.0000 p-value.

Descriptive Analysis

The descriptive results are reported in Table 1 where ρ_1 and ρ_2 symbolizes are first and second order autocorrelation (FSOA) coefficients separately while $SD(Z)$ and \bar{Z} symbolizes sample standard deviation (SSD) and sample average respectively. Similarly, Υ and K personifies skewness and kurtosis separately. Panel A of table 1 shows that with exemption of exchange rate volatility, all other macroeconomic predictors are positively skewed with indication that tail or asymmetry of probability distribution is on right side of our distribution and this permits logarithmic conversion of said predictors as such conversion seems to relax heteroskedasticity evident in regional panel analyses.

Also, JB statistics for exchange rate volatility and macroeconomic environment are excessively high implying absence of normality in distribution. Trade openness index averaged 96.451 and this could be reiterating free and open trading system which highlights intra-trading and/or external trading relations of COMESA countries. With SSD of 158.0735, variability in net flows of FDI into COMESA is substantial while average inflow attraction is less sizable with summary statistic of 1.327 %.

Table 1. Summary Descriptive Statistics

Panel A						
Predictors	$SD(Z)$	\bar{Z}	Υ	K	JB	$Prob$
Exchange rate volatility (ERV)	5.5826	106.379	-3.0589	2.3870	187.1547	0.0000
Net FDI flows (FD)	158.0735	1.327	2.0765	7.9375	1.2546	0.0000
Trade openness (T)	0.3564	96.451	1.3264	5.196	0.3692	0.0000
Macroeconomic environment (ME)	14.8794	116.860	-3.5327	6.579	109.1235	0.0000
Panel B						
Predictors	$SD(Z)$	\bar{Z}	ρ_1	ρ_2	T	$p - value$
Corruption control index (CC)	430.586	210.297	0.591	0.724	592	0.0000
Government stability index (GS)	7.1245	156.4	0.657	0.562	592	0.0000

Source: author's results

Panel Unit Root Test

In this study, we implemented the Im-Pesaran-Shin (IPS) panel unit root test and the results are as presented in Table 2 below. The results denote stationarity of variables at first difference; that is, all variables used for estimation are I(1) as the weighted statistics became significant with zero probability values.

Table 2. Panel Unit Root

Variables	@ levels		@ first Difference	
	W. Statistics	Prob. value	W. Statistics	Prob. values
Exchange rate volatility (ERV)	-1.0674	0.5090	-5.1367	0.0000
Net FDI flows (FD)	-0.2849	0.4322	-5.8629	0.0000
Trade openness (T)	-1.0042	0.1255	-4.5629	0.0000
Macroeconomic	2.9035	0.6523	-5.82964	0.0000

environment (ME)				
Exchange rate volatility (ERV)	-1.3096	0.3540	-6.5273	0.0000
Corruption control index (CC)	-0.1027	0.6523	-6.5492	0.0000
Government stability index (GS)	-0.0158	0.3540	-6.5643	0.0000

Co-integration Test Results

The Kao and Pedroni's tests were conducted for co-integration. Both tests suggest presence of co-integrating vectors since the probability value are significant at the 5 % critical value. The results are as shown in [Table 3](#).

Table 3. Results of Co-integration Test

Kao Residual Co-integration Test				
Test	t-Statistic		Prob.	
ADF	-7.6529		0.0000	
Residual variance	1.002E+14			
HAC variance	3.5862			
Pedroni Residual Co-integration Test Results				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	2.1058	0.7462	2.1058	0.0003
Panel rho-Statistic	2.3616	0.9861	2.3616	0.0007
Panel PP-Statistic	-2.5282	0.0647	-2.5282	0.0002
Panel ADF-Statistic	-3.9380	0.0585	-3.9380	0.0004

Analysis of Effects of Exchange Rate Volatility on FDI with Macroeconomic variables as Instruments

[Table 4](#) shows that at 1 % level, negative effects measured by standard deviation of logarithm of effective real exchange rate passes significance test with p-value of 0.008 and 0.000 respectively for both first-difference and System GMM estimates. The volatility coefficients are -0.3021 and -0.3015 respectively. The results also reveal significant side effect of the volatility in exchange rate on foreign investment inflows to COMESA countries based on the interaction of exchange rate volatility and macroeconomic environment. By implication, exchange rate volatility signifies macroeconomic instability that crowds out foreign investment. The reason is such that volatility in exchange rate discourages additional inflows of *fdi* as foreign investors would have been prompted to localize their investment and this could in turn occasion irreversibility of investment in the short-run. So, the deleterious effects of the volatility in exchange rate on *fdi* inflows to COMESA countries is significant.

The results further show significant negative effects of macroeconomic environment on *fdi* in the region. Trade openness played positive and significant role in stimulating inflows of FDI with coefficients of 0.4391 and 0.3567 for both the first-difference and system GMM estimations respectively. Hence, COMESA countries with vast trade openness invite additional inflows of *fdi*. The significance of trade openness could be re-enforcing export-oriented potential of some COMESA countries and hence indicative of host country's comfort of entrance to world market for resources inputs, so MNCs can obtain raw materials at low price. Accordingly, execution of open trade policies have potential of inviting additional foreign investments.

The relevant instruments used are, one-year lag of trade openness, and one year lag of macroeconomic environment as measured by inflation and the interaction of both openness and inflation and the first-difference of *fdi*. Both the first-difference and system GMM estimates show that market size played positive and significant role in stimulating inflows of *fdi* with coefficients of 0.0186 and 0.0123 respectively. Hence, COMESA countries with vast markets attract additional inflows of *fdi*. This corroborates findings of Anyanwu (2011).

Table 4. Dynamic GMM Panel Results with Macroeconomic Variables

First difference GMM Estimates	
Variables	Baseline Estimations
Constant	0.3258(0.000)***
Exchange rate volatility (ERV)	-0.3021(0.0080)**
Market size	0.0186(0.0001)***
Trade openness (T)	0.4391(0.0037)**
Macroeconomic environment (ME)	-0.0183(0.003)***
Net <i>fdi</i> flows (<i>fdi_2</i>)	0.0115(0.0002)***
Adjusted R ²	0.491
Wald (p-value)	860(0.0000)
Difference-in-Hansen	29.356 (0.0000)
Total observations	592
GMM-SYS Estimates	
Constant	0.29746(0.000)***
Exchange rate variation (ERV)	-0.3015(0.000)***
Market size	0.0123(0.0000)***
Trade openness	0.3567(0.0052)**
Macroeconomic environment	-0.0179(0.0001)***
ME ⊗ ERV	-0.0123(0.0000)***
Net <i>fdi</i> flows (<i>fdi_2</i>)	0.0104(0.001)***
Adjusted R ²	0.5001
Wald (p-value)	548(0.000)
Difference-in-Hansen	25.498(0.000)
Total observations	592

***, ** indicates significance @ 0.01, 0.05 respectively

Source: author's results (2020)

5.3 Analysis of Effects of Exchange Rate Volatility on FDI with Governance and Corruption Index as Instruments

The results with governance and institutional variables are reported in Table 5. With governance and institutional variables in first-difference GMM estimation; exchange rate volatility coefficient also passes significance test with p-value of 0.0005. This advances a scenario that inflows of foreign investment into recipient countries do not find any support in presence of volatility of exchange rate, rather such inflows are dissuaded. This corroborates the adverse effects of exchange rate volatility as noted by Umoru (2020) that volatility in exchange rate exposes importers and exporters to exchange rate risk.

Having estimated the first-difference GMM model with predictors of governance and institution; we re-estimated using the system GMM method with the relevant instruments namely, one-year lag of corruption index, one year lag of government stability index and their interaction as well as first-difference of foreign investment. In this estimation; we interacted corruption control index and government stability index. With these instruments, our results for volatility in exchange rate was statistically different from zero at one percent level. This implies that inflows of foreign investment are dissuaded by volatility effects of exchange rate.

Both the first-difference and system GMM estimates report significant negative coefficients of corruption control index with p-values of 0.0001 and 0.0006 respectively. In other words, ineffective corruption controls in COMESA countries negatively influence inflows of *fdi*. In principle, net inflows of *fdi* are constrained by corrupt practices.

Only government stability index is significant at 5 % level with coefficients of 0.0013 and 0.0014 and p-values of 0.0005 and 0.0002 respectively for the different GMM estimations. Accordingly, effect of duration in power of constitutionally elected government is positive and highly significant in inviting foreign investment into COMESA region.

The interacted coefficient of government stability index and corruption index (-0.0153) passes significance test with negative impact. A revelation that stable government with corrupt practices plays discourages invitation of *fdi* into African countries. This makes it evident that disregard for due process by government in power results in capital flight in Africa.

Table 5. Dynamic GMM Panel Results with Governance and Institutional Variables

First-Difference GMM Estimates	
Constant	0.3258(0.000)***
Exchange rate volatility (ERV)	-0.1012(0.0005)***
Net <i>fdi</i> flows (<i>fdi_2</i>)	0.0123(0.0000)**
Corruption control index (CC)	-0.0021(0.0001)***
Government stability index (GS)	0.0013(0.0005)***
Adjusted R ²	0.396
Wald (p-value)	530 (0.0000)
Difference-in-Hansen	29.016 (0.000)
Total observations	592
GMM-SYS Estimates	
Constant	0.29746(0.000)***
Exchange rate volatility (ERV)	-0.3941(0.00009)***
Net <i>fdi</i> flows (<i>fdi_2</i>)	0.0786(0.0056)**
Corruption control index (CC)	-0.0023(0.0006)***
Government stability index (GS)	0.0014(0.0002)***
CC ⊗ GS	-0.0153(0.0009)***
Adjusted R ²	0.430
Wald (p-value)	526(0.000)
Difference-in-Hansen	29.023(0.000)
Total observations	592
***, ** indicates significance @ 0.01, 0.05 respectively	

Source: Author's results (2021)

3. Conclusion

In this study we attempted to identify if exchange rate volatility impact favourably or adversely on *fdi* flows into COMESA region with macroeconomic policy predictors as well as governance and institutional predictors as control respectively. We estimated dynamic GMM panel models. Our estimations in all specifications show that the prevailing side effects of exchange rate volatility on inflows of *fdi* to COMESA countries are highly significant. Central contribution of this study resides with the fact that exchange rate volatility dissuades additional inflows of *fdi* as foreign investors would tend to localize their investment and this could be preparing a ground for investment irreversibility effect for all COMESA countries. This could be traced to the fact that such volatility in exchange rate intensifies macroeconomic insecurity which magnifies foreign investors' lack of confidence in the domestic economic environment. This corroborated the CSEA's report that *fdi* worth \$ 77.97 million in the second quarter of 2021 accounted for only 8.9 % of capital flows into Nigeria. This colossal drop in FDI inflows has been credited to exchange rate volatility (CSEA, 2021).

The study also points to the fact that inflows of *fdi* follows trajectory of previously existing inflows. Precisely, countries of Common Market for Eastern and Southern Africa region ought to maximize gains of existing *fdi* inflows. Concisely, trade openness influences inflows of *fdi* positively and significantly while macroeconomic environment is significantly hostile to hosting *fdi* in COMESA region. Lastly, stable constitutionally elected government positively and significantly invite inflows of *fdi* into the region while net inflows of *fdi* are dissuaded by corruption. Accordingly, need for transparent governance in attracting foreign investment into COMESA region cannot be overstated going forward; and most importantly, as earlier remarked in Umoru

(2020), there is need to workout healthy control in management of foreign exchange markets frequently in line with global code of forex market.

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УДК 33

Волатильность обменного курса и потоки иностранных инвестиций: динамический панельный анализ с участием африканских стран

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Аннотация. Статья нацелена на изучение вопроса, привлекает ли волатильность обменного курса иностранные инвестиции в Африку или препятствует им с использованием системы динамической панельной оценки GMM за период с 2010 по 2020 гг. В частности, мы внедрили GMM с первым различием по методу Арельяно-Бонда и системные оценки GMM, поскольку нам необходимо было оценить динамическую *fdi* модель панельных данных разных африканских стран, используя общий рынок для региона Восточной и Южной Африки в качестве тематического исследования. При оценке использовались два набора контрольных предикторов, а именно макроэкономические переменные фискальной политики и институциональные переменные. Таким образом, доминирующим выводом данного исследования подтверждается, что преобладают негативные побочные эффекты волатильности обменного курса, которые сдерживают приток ПИИ в африканские страны. Коэффициенты волатильности равны -0,3021 и -0,3015 для оценки GMM с первым различием и системы GMM соответственно. И негативные последствия такой нестабильности чрезвычайно значительны. Соответственно, волатильность обменного курса проявляется в макроэкономической непредсказуемости, которая вытесняет иностранные инвестиции. Это может быть объяснено тем фактом, что такая волатильность и/или нестабильность обменного курса усиливает экономическую неопределенность, которая усиливает недоверие иностранных инвесторов к внутренней макроэкономической среде. Исследование также указывает на тот факт, что приток ПИИ отслеживает траекторию ранее существовавших притоков ПИИ. Именно, регион КОМЕСА должен разработать стратегию, направленную на максимизацию выгод от преобладающего до сих пор притока ПИИ.

Ключевые слова: COMESA, ПИИ, руководство, динамическая панельная модель, первичный GMM, системный GMM.

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